COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, VIRGINIA 23219 2000

Gregory A. Whirley
Acting Commissioner

June 30, 2010

The Honorable Charles J. Colgan
Virginia State Senate
10677 Aviation Lane
Manassas, Virginia 20110-2701

The Honorable Lacey E. Putney
Virginia House of Delegates
P.O. Box 127
Bedford, Virginia 24523

The Honorable Sean T. Connaughton
Secretary of Transportation
Patrick Henry Building, 3rd Floor
1111 East Broad Street
Richmond, Virginia 23219

Dear Gentlemen:

Item 455 I.2 of Chapter 781 of the 2009 Acts of Assembly requests the Virginia Department of Transportation (VDOT) to recommend to the Secretary of Transportation and the Commonwealth Transportation Board (CTB) the most effective approach to restore vegetation within the construction corridor of the High Occupancy Toll (HOT) Lanes on the I-495 Capital Beltway. The language requests that the recommendations be included in a report that includes an estimate of costs.

The Virginia Transportation Research Council (VTRC) conducted a review of reforestation best practices for the HOT lanes project construction corridor. Pursuant to Item 455 I.1 of Chapter 781 of the 2009 Acts of Assembly, the best practices review was presented to the Secretary of Transportation and the CTB in December 2009. A copy was also provided to the Virginia Megaprojects General Engineering Contractor for use in a conceptual study for reforestation on the cleared and altered areas within the I-495 HOT Lanes project limits.

The estimate to restore vegetation along the I-495 Capital Beltway HOT Lanes corridor is $5 million. This estimate includes site preparation, plant material and labor. The landscape recommendations delineated in this report include low-maintenance options that incorporate slow growth vegetation.

If you have any questions or need additional information, please contact me.

Sincerely,

Gregory A. Whirley, Sr.
Acting Commissioner

cc: Members of the Commonwealth Transportation Board

PREFACE

Item 455.I.2 of Chapter 781 of the 2009 Acts of Assembly requires the Virginia Department of Transportation (VDOT) to recommend to the Secretary of Transportation and Commonwealth Transportation Board the most effective approach to restore vegetation within the construction corridor of the High Occupancy Toll Lanes on the I-495 Capital Beltway. The recommendations, as well as estimates of costs, shall be included in a report to the Secretary and the Chairmen of the House Appropriations and Senate Finance Committees by June 30, 2010.

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EXECUTIVE SUMMARY

Pursuant to item 455.I.1 of Chapter 781 of the 2009 Acts of Assembly, the Virginia Transportation Research Council (VTRC) conducted a study of best practices for the reforestation of the Interstate-495 High Occupancy Toll (HOT) Lanes project construction corridor. The best practices review was presented to the Secretary of Transportation and the Commonwealth Transportation Board in December 2009, and a copy was provided to the Virginia Megaprojects General Engineering Contractor (GEC) for use in a conceptual study for the reforestation of the cleared and altered areas within the I-495 HOT Lanes project limits.

The GEC conceptual study subsequently provided recommendations that align with the VTRC study and satisfy requirements of item 455.I.2 of Chapter 781 of the 2009 Acts of Assembly to recommend the most effective approach to restore vegetation within the construction corridor. The recommendation is to utilize a combination of techniques to develop meadow zones dominated by native grasses and other non-woody plants, transitional zones dominated by a tree canopy of juvenile pioneer species as well as grasses and other herbaceous plant material, and reforestation zones dominated by diverse species of hardwood trees with a dense canopy that shades out most undergrowth.

The estimate of the probable cost to restore vegetation along the I-495 HOT Lanes corridor is $5,000,000 (in 2010 dollars). This estimate includes site preparation, plant material, and labor.

Introduction and Purpose

As part of the Interstate 495 (I-495) High Occupancy Toll (HOT) Lanes project in Fairfax County, Virginia, at the request of the Virginia Department of Transportation (VDOT), the Virginia Megaprojects General Engineering Consultant (GEC)[1] conducted a review and landscape analysis of the I-495 HOT Lanes in July and August of 2009. The review and analysis coincided with the natural and succession planting techniques recommended in December 2009 by the Virginia Transportation Research Council (VTRC) in its report to the Secretary of Transportation and the Commonwealth Transportation Board. The review and analysis identified areas for potential landscape enhancements and provided recommendations for the most effective approach to implementation.

The I-495 HOT Lanes project area stretches approximately 14 miles along I-495 from the Springfield Interchange to just north of the Dulles Toll Road. The project's potential landscape area (PLA) was defined as all areas within the VDOT I-495 right-of-way that had been cleared or altered. The project was subdivided into the eight sections that corresponded to those previously designated for design and construction by the design-build contractor, HNTB. The sections on the I-495 Capital Beltway are:

Section 1 – North of the Springfield Interchange to Braddock Road
Section 2 – Braddock Road to Little River Turnpike (Route 236)
Section 3 – Little River Turnpike to Gallows Road
Section 4 – Gallows Road to Route 50 (Lee Jackson Boulevard)
Section 5 – Route 50 (Lee Jackson Boulevard) to Route 29 (Lee Highway)
Section 6 – Route 29 (Lee Highway) to Leesburg Pike
Section 7 – Leesburg Pike to Old Dominion Drive
Section 8 – Springfield Interchange

The GEC design team began the study with a period of general research that included soliciting information from interested community groups and conferring with related professionals. A review of proposed roadway design was then undertaken and three sections within the PLA were deemed representative of the entire project. Several factors were considered in making the selection. Most importantly, the size and shape of the interchange, presence of surrounding neighborhoods and the status of design plans at the time of selection. Two mid-size interchanges (Braddock Road and Little River Turnpike) and one complicated or double interchange (Gallows Road and Route 50) were selected. The design plans for the Tysons Corner interchanges were not close to final at the time of selection, so it would not have been possible to include them in an analysis of landscaping needs.

The three sections selected for review—Section 2 (Braddock Road), Section 3 (Little River Turnpike), and Section 4 (Gallows Road and Route 50)—were then analyzed in depth to determine opportunities and constraints. Several possible landscape improvement techniques were investigated in terms of benefits, limitations, and lifecycle value (initial planting, ongoing maintenance, and lifespan of various options, i.e., self-perpetuating plans such as wildflowers and perennials), and three prototypes were defined. Lastly, the data and analysis were

[1] The GEC is a joint venture between CH2M Hill and ATCS, PLC.

synthesized into general landscape recommendations for the corridor utilizing a zone system. (See “Phase III: Design Analysis” for a more detailed description of landscape zones.)

Phase I: Data Collection

The first step taken by the GEC design team was to gather information relevant to the project and solicit community and professional input.

Research

The team referred to state and federal highway regulations and local ordinances as well as official publications from Virginia state agencies, local jurisdictions, the Federal Highway Administration (FHWA), and other state departments of transportation. Regulations promulgated by VDOT and FHWA were reviewed for requirements related to sight distances at interchanges and "clear distance," the lateral space along travel lanes in which unprotected impediments are prohibited. These requirements limit the range of options for trees or high growth vegetation in the HOT Lanes corridor. Similar corridor enhancement project case studies in the publications were also investigated, and a demonstration project was viewed, to consider innovative approaches and techniques from other states which could be adopted locally.

The team also explored several areas of landscape theory and practice. Three levels of landscape improvement were defined by the team as applicable for this project. These are protection and preservation, restoration and rehabilitation, and enhancement. "Protection and preservation" was defined as the identification and maintenance of existing plants, important geographical features and ecosystems within the corridor. "Restoration and rehabilitation," for the purposes of this study, is the restoration of the natural habitat. "Enhancement" is a level of beautification that typically involves a high level of maintenance.

(See Appendix 2: Resources for a complete listing of references used in the Research phase.)

Public Outreach and Participation

The public outreach and information program was established as a forum to obtain and understand public input and public feedback. The GEC design team met with public groups impacted by the improvements and representatives of VDOT to determine their concerns and priorities. The GEC design team coordinated, facilitated, organized and prioritized the public's input and feedback to determine which areas along the corridor would be suitable for potential landscape enhancements given the fixed construction budget.

The Fairfax County Restoration Project (FCRP) and Virginia Megaprojects, a collaborative effort between VDOT and the Virginia Department of Rail and Public Transportation to manage multi-modal projects such as the HOT Lanes, have been collaborating to address concerns that have surfaced from the HOT Lanes project regarding the removal of existing vegetation. Two public meetings were hosted by the FCRP on July 21 and August 18, 2009. These meetings allowed for small group discussions to identify people, communities and organizations impacted as well as locate potential reforestation or landscape restoration and enhancement areas and converse on possible plant material. The GEC design team attended both meetings. The July 21 work session focused on areas outside of the right-of-way and the August 18 meeting focused on areas inside the right-of-way.

Three work session groups were formed that spilt the HOT Lane project into three areas. These areas and key representatives are outlined below:

Area 1 – Springfield Interchange to Little River Turnpike

- Vivian Watts – State Delegate in the 39th District
- Deb Sherman – Aide to Vivian Watts
- Jim McGlone – Virginia Department of Forestry – Fairfax County
- Ed Stock – President of the North Springfield Civic Association

Area 2 – Little River Turnpike to Route 50

- Carl Iddings – Lafayette Village Community Association
- Kris Unger – Fairfax County Planning Commission (Environmental Committee)
- Mike Fitch – VTRC, a division of VDOT

Area 3 – Route 50 to the end of the HOT Lanes project (Old Dominion Drive)

- Micah Himmel - Linda Smyth's Office (Fairfax County Board of Supervisors, Providence District)
- Cheryl Patton - John W. Foust's Office (Fairfax County Board of Supervisors, Dranesville District)
- Bill Harrell – Fairfax County Department of Transportation
- Ron Tuttle – Fairfax County Department of Public Works - Stormwater Planning Division
- Linda Burchfiel – Great Falls Chapter of the Sierra Club

The GEC design team documented the following feedback based on the two FCRP meetings:

- The FCRP would like more information on the GEC landscaping program and what it can offer to the corridor.
- FCRP attendees seem to support a "reforestation" approach over a "traditional" urban landscape scheme. Traditional plantings would include substantial street trees and shrubs whereas reforestation essentially helps with the natural re-growth of forest cover, utilizing techniques such as planting saplings and wildflowers and the eliminating invasive species which tend to choke out desired growth.
- The attendees strongly pushed for soil amendments, native plantings, riparian planting, storm water management (SWM) enhancements, understory vegetation, and shrubs along sound walls.
- FCRP wants to see the biggest focus at the interchanges.

Public involvement is ongoing. Initial landscaping requests from the public included items well beyond the scope and budget of the project, such as stream restoration and decorative plantings. The GEC design team, however, committed to working with several homeowners groups and devoting substantial design time to ensure landscaping plans for the HOT Lanes corridor were consistent with existing landscaping schemes in their neighborhoods. As part of a reciprocal relationship between Megaprojects and the community, FCRP identified several sources of volunteer assistance that could mitigate the cost of landscaping once the final budget was established.

Professional Collaboration

The GEC design team conferred with several individuals whose input and experience were valuable to the understanding of the project parameters and precedents.

The team met with the VDOT landscape architect, Ellen Vogel, on August 12, 2009. Ms. Vogel offered insights on the VDOT process and guidelines, provided additional resources, and described VDOT's Route 1 landscaping enhancement project as an example.

She also provided the design team with the following:

- Seed mix for road side grasses specifically designed to result in low-growing grasses that require little or no maintenance and mowing.
- VDOT Roadside Landscaping Guidelines.
- Information on the Tysons Corner Task Force, which is providing a SWM Landscape Enhancement 1 Pond at the Route 123 interchange. (A SWM landscape enhancement involves making aesthetic improvements to a stormwater management pond, in this case a dry pond, to provide a more pleasing view from neighboring highrise buildings. It is anticipated that this project will provide screening with various trees and shrubs and in-pond planting using vegetation that is tolerant of inundation during storms.)
- A streamlined process for private residents, homeowners associations, and community organizations to landscape in areas outside of the right-of-way adjacent to the I-495 HOT Lanes.

The design team met with John Morse, the Virginia Megaprojects GEC Construction Manager of the I-495 HOT Lanes Project, on August 3, 2009. This meeting was held to discuss the complications of working on landscaping while construction is ongoing. If landscaping were done concurrently with construction utilizing the current Maintenance of Traffic Plan for the overall HOT Lanes project, there would be a potential for damage to landscaping by construction vehicles, narrow corridor constriction for construction and landscaping vehicles and staging areas, and additional costs incurred when landscaping has to be halted for certain construction activities. In contrast, if landscaping were postponed until completion of construction activities, the potential for damage and delay costs would be minimized. From the discussion, it was determined that landscaping would be deferred until the end of construction and a maintenance of traffic plan for the landscaping project will probably not be required; however, this will be discussed further as the designs develop.

As part of the research effort, the team also attended a meadow installation at the Laurel Hill Park in southern Fairfax County, Virginia. Hosted by Charles Smith of the Fairfax County Park Authority, the demonstration covered site selection, site preparation, seed selection and equipment. As part of the demonstration, a small meadow was installed using a seed drill and fertilizer was applied using a hydroseed truck. The meadow was installed on an area dominated by fescue grass,[2] however, due to permitting issues, chemicals were not used to kill the invasive

[2] Although it is a common and favorite seed for residential areas, fescue grass can be considered invasive due to its tendency to spread.

fescue prior to installation. This technique is of particular interest to the GEC design team as a technique that could be used on the I-495 project.

The project partners for the meadow installation were the Fairfax County Park Authority, Lardner/Klein Landscape Architects, P.C., ESA, Inc. and M.E.T. Limited, Inc./Wayfarer Environmental Technologies.

Phase II: Data Analysis

The data gathered in Phase I were applied to a site-specific analysis of each section and in the definition and assessment of landscape improvement prototypes.

Site Analysis

Based on the research performed by the GEC design team, a checklist of landscape design factors was established. These factors relate to climate and microclimate, disturbances, existing ecological communities (e.g., wetlands), and highway safety and design. (See Appendix 3: Landscape Design Consideration Checklist Factors.) This checklist was used to systematically assess the corridor sections in terms of general design constraints and opportunities.

Due to the complications and intricacies involved with the large site, the site analysis was undertaken using a two-tiered approach. Initially, the final roadway plans were utilized for a general review. This review looked at I-495 HOT Lanes corridor in light of the context of the final roadway plans, including the identification of adjacent communities, parks, business districts, interchanges and major utilities. (See Appendix 4: Major Elements.)

After this general review, digital MicroStation files (DGN) were employed in a more detailed site analysis. A base map of the entire project was assembled showing property and right-of-way lines, streams, wetlands, tree save areas,[3] topography, sound walls and the proposed roadway design. The base map was overlaid onto aerial photography to graphically illustrate the site's constraints and opportunities. Copies of MicroStation files and illustrative graphics are available upon request.

Based on the findings of the review, specific areas were selected for an on-site field analysis. These field investigations, to be conducted at a future date, will identify and document the following features:

- soils
- topography
- hydrology
    - existing ecological communities
    - presence of exotic plant species
- abundance or lack of native plant species
- disturbances
- climate and microclimate

Landscape Prototype Analysis

Utilizing data gathered in Phase I, the GEC design team defined three landscape prototypes:

1. Traditional Landscape – Composed of non-native and native manicured trees, shrubs, flowers, groundcovers and grasses, this landscape requires a high level of labor to

[3] A tree save area is an area where existing forest cover was not removed.

maintain crisp edges and a well-defined appearance. Significant material inputs, such as water and fertilization, are also necessary to maintain plant health.

2. Natural Landscape – This landscape uses only plants, including trees, shrubs, groundcover and grasses, that are native or adapted to the climate, geology and hydrology of the site in which they are located. This style is generally lower-maintenance than a traditional landscape due to its looser, more naturalized character. Reduced or no inputs are required to sustain the plant material.

3. Managed Succession – This low input method takes advantage of erosion control seeding that is or would be in place in the disturbed areas as part of construction best management practices. This landscape approach allows the naturally occurring plant material on site, including unseen seeds and roots, to develop unaided. The plant material that spontaneously occurs on site, also known as successional growth, is allowed to develop without mechanical or material input. However, selective use of herbicides and a prescribed maintenance program may be required to control invasive and exotic species in order to allow the desired native species to thrive.

Each of these three landscape prototypes could be employed as a stand-alone approach or in combination and each possesses ecological, aesthetic, and budgetary strengths and weaknesses.

Upon analysis of these three prototypes, it was determined that the "traditional landscape" model was inappropriate for general large scale application in the corridor due to the large project area, budget and maintenance limitations, and potential environmental impact. However, this type of landscape may be appropriate and desirable in certain focal or significant areas. The opportunity exists for interested parties such as neighborhood associations, business improvement districts or other public or private entities to adopt specific areas along the corridor. These groups could donate funds and labor to allow for enhanced landscaping and maintenance in some focal areas. (VDOT's *Comprehensive Roadside Management Program* (24 VAC 30-121) regulations allow private businesses, civic organizations, communities, individuals and local governments to improve the appearance and safety of the state maintained right-of-way along noncontrolled and controlled access primary and secondary highways, and interchanges with controlled access interstates, subject to design criteria and installation specifications. Interested groups may also be able to provide landscaping behind soundwalls at neighborhood locations.)

Based on the analysis and input from the community, it was determined that the "natural landscape" is the preferred model for implementation in a majority of the highly visible and accessible areas of the corridor. This model possesses the environmental appropriateness, reasonable installation and maintenance cost, positive public perception, and native approach deemed desirable in the earlier phases of the study.

The "managed succession" landscape was deemed appropriate for implementation in areas of minimal visibility, where naturalization had already begun to occur or where maintenance would be impractical. This approach has many benefits such as minimal environmental impact, installation and maintenance cost. However, this model has a less refined appearance during the establishment phase, can conflict with some safety goals along the roadway, and is best suited to a larger landscape area.

The design team found that “managed succession” and “natural landscape” concepts could be successfully implemented in close proximity to each other.

Phase III: Design Analysis

The findings of Phase II were used in the development of a preliminary landscape strategy defined by three landscape zones. These zones were analyzed in terms of suitability to the specific sites and a preliminary cost analysis was undertaken.

Landscape Zones

With the three landscape prototypes in mind, a model of "landscape zones" was developed to address site-specific geometry along the corridor. The landscape zones incorporate both the "natural landscape" and "managed succession" prototypes. The zones are applied in such a way as to mimic patterns and processes found in nature and also to work within existing standard highway maintenance practices.

Three zones were defined for implementation along the corridor: meadow area, transitional area and reforestation area. The implementation of these zones is dependent upon the width of the potential landscape area in specific locations, site slopes and the accessibility of these locations by maintenance crews.

The "meadow" zone is a type of "natural landscape" dominated by native grasses and other non-woody plants (forbs). The deep roots of the grasses help prevent erosion by stabilizing the soil, and over time decaying roots create a nutrient rich soil. In nature, environmental events such as animal grazing, occasional fire, and seasonal drought help prevent trees and large shrubs from becoming dominant. These environmental events can be mimicked through a system of scheduled mowing. This zone has been designated as the area directly adjacent to the roadway for several reasons. This location provides the most direct access for mowing equipment and allows for visual clearances and physical access to be maintained directly adjacent to the roadway. This zone provides seasonal interest and texture where the landscape is highly visible. This zone is suitable for implementation in most areas regardless of size or slope.

As a meadow zone develops without mowing, pioneer trees and large shrubs begin to appear as part of the natural succession process. When this occurs, this area becomes what, for purposes of this study, is called a "transitional area." It is dominated primarily by a tree canopy of juvenile pioneer species such as Virginia Pine, Cedars, Tulip Poplar, Black Locust, Sweetgum and Black Willow and contains a significant level of grasses and other herbaceous plant material. This type of "managed succession" landscape can be allowed to develop simply by foregoing routine mowing and eliminating invasive species. This technique is most suitable in the zone beyond the meadow zone where routine mowing may be more prohibitive. Establishment of a transitional zone allows for the development of larger and more diverse plant material where space allows and is suitable for implementation along the corridor where there is adequate planting area beyond the meadow zone.

Lastly, to promote and accelerate the establishment of mature forest areas, an area can be planted with a high density of tree seedlings. This area would undergo a natural successional process similar to that found in the transitional area but would ideally develop into a mixed hardwood forest at an earlier time. When mature, this area is dominated by diverse species of hardwood trees with a dense canopy that shades out most undergrowth. This zone, another type of "managed succession" landscape, is known as a "reforestation area". It is most appropriate in

areas large enough to accommodate the extensive canopies and root systems of the mature trees that would eventually exist.

Using general criteria established (see Appendix 3), Sections 2, 3, and 4 were reviewed to determine the suitability and potential for the establishment of these zones along the corridor. It was discovered that a majority of the project's PLAs are relatively narrow and steep and are best suited to establishment of a meadow zone. In some locations, the slope and width of the PLA also allows for implementation of a transitional zone. The implementation of reforestation areas is also possible in some particularly generous PLAs adjacent to the roadway.

A unique opportunity exists at the interchange and ramp areas, which were found to have a smaller ratio of plantable area to the buffer area. The PLAs in these cases, however, tend to be larger in contiguous size and are thus very well suited to support a reforestation zone.

Lastly, for safety reasons such as maintaining adequate sight distances and clear zones, the landscape in some areas will be required to be maintained at less than 24 inches in height, and trees with a mature caliper of over 4 inches need to be excluded. These areas could be planted with low growing native grasses and groundcovers. It should be noted that if a VDOT approved grass mix has already been established in these areas as part of best management practices, implementation of other grasses and groundcover may no longer be feasible or practical. A determination may be made that these areas are best left undisturbed.

Cost Analysis

Information gathered in Phase I, particularly research of similar case studies, revealed that bid and construction costs of native landscape installations can vary significantly. The size and type of plant material specified, installation and maintenance techniques employed and project scale have significant impact on ultimate project cost.

The GEC design team researched and developed a cost analysis spreadsheet based on the zone scheme applied to sections 2, 3 and 4. Several assumptions were made in establishing the cost estimate. In keeping with best management practices (and as part of the Amended and Restated Comprehensive Agreement (ARCA) between VDOT and Capital Beltway Express, LLC, a joint-venture of Fluor and Transurban), all disturbed areas within the PLA must be stabilized with loam and VDOT-approved seed for erosion control prior to the commencement of the landscape enhancement. This practice provides the added benefit of a large reduction in site preparation costs upon the commencement of final landscape installation. However, this technique also precludes amending the soil. Soil amendments can be beneficial to the establishment of plant material but the process of making them is costly and labor intensive. It was determined by the design team that amendment of soils along the corridor was not a prudent use of available resources for this project.

For the purposes of cost estimation, Sections 2, 3 and 4 were considered representative of the entire project. The project's PLA was calculated as 23.6 acres per section, with seven sections yielding a total PLA of 165 acres. (Section 8, the Springfield interchange, was excluded from the scope of this study because work is limited to connector bridges and internal ramps; landscaping was included in the previous reconstruction of the interchange.) Of the 165 acres, an estimated 34 acres are within a storm water management (SWM) area and have been omitted

from the cost analysis. Further review of the SWM designs is required to determine the level of landscaping that can be accommodated in these areas; however, this cannot be accomplished until final design of SWM facilities has been completed.

The I-495 HOT lanes landscaping budget is $5,000,000. The landscaping budget is part of a larger supplemental funding package secured in 2009 to support the Amended and Restated Comprehensive Agreement between the VDOT and the Capital Beltway Express, LLC. The set of change orders in the supplemental funding package are mainly funded with federal funds and have been authorized by FHWA. Initial cost estimates for the natural or succession planting techniques recommended by the VTRC and the GEC design team support the $5,000,000 budget. Design directives are tailored to working within the budget to establish the maximum effect for the amount available. This puts a premium on the design parameters and coordination with local efforts and abutting property owners.

The initial schedule for design and implementation is as follows for the $5,000,000 budget:

Project Phase	**Costs**
Conceptual Design	$168,000
Public Information Outreach	$50,000
Final Landscape Design Plans	$250,000
Construction (of Landscaping)	$4,385,000
Construction Inspection	$147,000
Total Costs	**$5,000,000**

Phase IV: Design Recommendations

The goal of the study was to determine a landscape strategy that mitigates the removal of existing vegetation within the project right-of-way and is sustainable in the long term. The success of the landscape effort hinges upon a thorough understanding of the site conditions, careful consideration of safety criteria and community objectives, selection of appropriate plant material, and establishment of and adherence to a prescribed maintenance plan. At the time of this report, the preliminary recommended design scheme is a zoned system of meadow, transitional and reforestation areas based on "natural" and "managed succession" landscape prototypes. Allowances have also been made for a more intensive "traditional" landscape where appropriate.

This preliminary report describes the initial phases of a process aimed at achieving the project goals. Further efforts are required in this pursuit including, but not limited to:

- Analysis of remaining sections
- Refinement of cost estimate and project budget
- Development of short and long term maintenance plans
- Continued public outreach and participation
- Outreach to other state agencies and non-profit organizations to discuss potential partnerships
- Development of specific planting plans including material specifications

The recommendations of the design team are low-maintenance options that incorporate natural processes and VDOT's slower-growth grass seed mix. Maintaining a regular schedule of mowing and clearing of brush will be necessary to accommodate sight distance and clear zone requirements that are essential to the safety of the traveling public along the HOT Lanes. Based on the roadway category (interstate) and projected average daily traffic count, landscape maintenance along the HOT Lanes will have a Service Level B in accordance with VDOT's current Service Level Mowing and Litter Removal Guide. This level includes litter removal and not more than three mowings per year. Sight distance and other safety concerns take priority over Service Level, so additional mowing may need to be performed.

An additional option for maintenance of landscaping is VDOT's Comprehensive Roadside Management Program (CRMP). Under this program, private businesses, civic organizations, communities, individuals and local governments are permitted to fund and perform landscaping and landscape maintenance along interstates; however, these organizations are not permitted to place recognition signs bearing their names on the interstate right-of-way, except at certain interchanges. CRMP permits are issued to the locality in which the landscape activities are to be performed with the intent that the locality is responsible for maintaining the landscape in perpetuity. The locality coordinates the private businesses, civic organizations, communities, individuals and local government groups performing the actual maintenance.

The I-495 HOT Lanes project presents a noteworthy opportunity to establish a visually pleasing, sustainable, and appropriate natural landscape for both the immediate community and the thousands of commuters that pass through the corridor each day.

APPENDIX 1 – Legislation

Item 455.I of Chapter 781 of the 2009 Acts of Assembly

I.1. It is the intent of the General Assembly that prior to the completion of construction of High Occupancy Toll Lanes on the I-495 Capital Beltway, the Virginia Transportation Research Council (VTRC) will conduct a review of reforestation best practices and approaches used with major infrastructure improvements in densely populated areas. The VTRC shall report its findings to the Secretary of Transportation and the Commonwealth Transportation Board prior to December 31, 2009.

2. Following completion of the review, the Department of Transportation shall recommend to the Secretary and Commonwealth Transportation Board the most effective approach to restore vegetation within the construction corridor. The Department shall provide a report including estimates of costs to the Secretary and the Chairmen of the House Appropriations and Senate Finance Committees by June 30, 2010.

APPENDIX 2 – Resources

The publications listed below provided much of the information used in the development of this report. For additional information to supplement this guide see the links below.

American Association of State Highway and Transportation Officials. *A Guide for Transportation Landscape and Environmental Design*. 2nd ed. Washington, DC: American Association of State Highway and Transportation Officials, 1991.

Austin, Samuel H. *Riparian Forest Handbook 1: Appreciating and Evaluating Stream Side Forests*. Charlottesville, VA: Virginia Department of Forestry, 1999. http://www.dof.virginia.gov/resinfo/resources/Riparian-Forest-Handbook_1.pdf. Accessed July 7 – August 28, 2009.

Fairfax County, Virginia, *Chesapeake Bay Preservation Ordinance* (2007), Ch. 118. http://www.fairfaxcounty.gov/dpwes/environmental/cbay/ch118may2007.pdf. Accessed July 7 – August 28, 2009.

Fairfax County (Virginia) Department of Public Works and Environmental Services. Public Facilities Manual. Fairfax, VA: Fairfax County Department of Public Works and Environmental Services, 2001. http://www.fairfaxcounty.gov/dpwes/publications/pfm/. Accessed July 7 – August 28, 2009.

Federal Highway Administration. *Federal Lands Highway Project Development and Design Manual*. Washington, DC: Federal Highway Administration, 2008. http://flh.fhwa.dot.gov/resources/manuals/pddm/Chapter_09.pdf#9.5.4. Accessed July 7 – August 28, 2009.

Lott, Gerald G., P.E. and Phil Graham, Jr., ASLA. *Florida Highway Landscape Guide*. Tallahassee, FL: Florida Department of Transportation, 1995. http://www.dot.state.fl.us/EMO/beauty/landscap.pdf. Accessed July 7 – August 28, 2009.

Maryland Department of Transportation State Highway Administration. "Maryland Highway Wildflower Guide." Baltimore, MD: Maryland Department of Transportation. http://www.dot.state.fl.us/EMO/beauty/landscap.pdf. Accessed July 7 – August 28, 2009.

Massachusetts Department of Transportation. "Landscape and Aesthetics." Project Development & Design Guide Design Guidelines. Boston, MA: Massachusetts Department of Transportation, 2006. http://www.mhd.state.ma.us/downloads/designGuide/CH_13_a.pdf. Accessed July 7 – August 28, 2009.

North Carolina Department of Transportation Division of Highways. *Guidelines for Planting within Highway Right-of-Way*. Raleigh, NC: North Carolina Department of Transportation, 2002. http://www.ncdot.org/doh/operations/dp_chief_eng/roadside/design/graphics/PlantingGuidelines.pdf. Accessed July 7 – August 28, 2009.

Ohio Department of Transportation. *Roadside Safety Landscaping Guidelines*. Columbus, OH: Ohio Department of Transportation, 2006.

http://www.dot.state.oh.us/policy/AestheticDesign/Documents/ref_landscaping_jan06.pdf. Accessed July 7 – August 28, 2009.

Virginia Department of Conservation and Recreation. Invasive Plants Lists (electronic document). http://www.dcr.virginia.gov/natural_heritage/invspinfo.shtml. Accessed July 7 – August 28, 2009.

Virginia Department of Conservation and Recreation. Native Plants Lists (electronic document). http://www.dcr.virginia.gov/natural_heritage/nativeplants.shtml. Accessed July 7 – August 28, 2009.

Virginia Department of Transportation. *Guidelines for Planting Along Virginia's Roadways*. Richmond, VA: Virginia Department of Transportation, 2007. http://www.extranet.vdot.state.va.us/locdes/files/Planting_Guidelines.pdf. Accessed July 7 – August 28, 2009.

Virginia Department of Transportation. *Road Design Manual*. Richmond, VA: Virginia Department of Transportation, 2005. http://www.virginiadot.org/business/locdes/rdmanual-index.asp. Accessed July 7 – August 28, 2009.

Virginia Department of Transportation. "Roadside Development." *VDOT CADD Manual* (1995). http://www.extranet.vdot.state.va.us/locdes/electronic%20pubs/CADD_%20MANUAL/graphics/rdsddev.pdf. Accessed July 7 – August 28, 2009.

APPENDIX 3 – Landscape Design Consideration Checklist Factors

Climate and Microclimate

General climate factors to consider:

- maximum and minimum temperatures (daily, monthly, yearly)
- average daily temperatures
- total average yearly precipitation

Microclimate factors to consider:

- aspect of site (north-facing, south-facing, etc.)
- topography
- shade (areas under tree canopy, bridge shadows, in a depressed area, etc.)
- distance from pavement or other impervious surfaces

Disturbances

Disturbances to look for:

- chemical contamination
- road or construction debris
- invasive species
- mechanical disturbance
- soil compaction
- erosion

Existing Ecological Communities

- tree protection areas
- adjacent plant communities
- wetlands
- streams

Highway Safety and Design Considerations

- account for barrier deflection
- avoid large evergreen trees on the south side of east-west intersections
- sight distances
- ensure clear zones that have no barriers are free of obstacles
- account for snow storage and de-icing
- drainage ditches
- highway signage
- major utility easements
- inaccessible or hard to maintain areas

APPENDIX 4 – Major Elements

Parks

- Lake Accotink Park (Section 3)
- Wakefield Park (Section 3)
- Fitzhugh Park (Section 3)
- Mill Creek Park (Section 3)
- Holmes Run Stream Valley Park (Section 4)
- Timberly Park (Section 7)
- Scott's Run Stream Valley Park / Washington and Old Dominion Trail (Section 7)

Streams

- Flag Run (Section 2)
- Accotink Creek (Section 3)
- Holmes Run (Section 5)
- Pimmit Run (Section 6, Section 7)

Major interchanges

- Route 50 (Section 4)
- Interstate 66 (Section 5)
- Route 7 (Section 6)
- Dulles Toll Road (Section 7)
- Route 123 (Section 7)

Major communities

- Springfield Civic Association
- North Springfield Civic Association
- Lafayette Village Community Association
- Holmes Run Homeowners Association
- Lakeford Community Association